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☐ 1. Document ID: US 6618171 B1

Using default format because multiple data bases are involved.

L6: Entry 1 of 13

File: USPT

Sep 9, 2003

US-PAT-NO: 6618171

DOCUMENT-IDENTIFIER: US 6618171 B1

TITLE: Black point adjustment based on image background

DATE-ISSUED: September 9, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---------------------|-----------|-------|----------|---------|
| Tse; Francis | Rochester | NY | | |
| Nagarajan; Ramesh | Fairport | NY | | |
| Farnung; Charles E. | Rochester | NY | | |

US-CL-CURRENT: 358/446; 358/453, 358/463, 382/254, 382/255

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Summary | Attachments | Claims | KWC | Draw Desc | Image |
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☐ 2. Document ID: US 6222642 B1

L6: Entry 2 of 13

File: USPT

Apr 24, 2001

DOCUMENT-IDENTIFIER: US 6222642 B1

TITLE: System and method for eliminating background pixels from a scanned image

Abstract Text (1):

An image desired to be reproduced is scanned to determine its video pixel gray values. A histogram generator generates a histogram distribution representing a frequency of the gray values. The histogram distribution is analyzed to determine a background peak gray value of the image and a standard deviation of the histogram distribution based on a Gaussian approximation. A thresholding circuit dynamically adjusts the background peak value based on the standard deviation and a selected scaling factor to generate a background threshold value. The background threshold value expands a range of background gray values in the image which are eliminated during image reproduction. Eliminating substantially all background gray values improves the quality of the reproduced image.

Application Filing Date (1):

19980810

Detailed Description Text (13):

With further reference to FIGS. 2 and 3, the histogram data is then read for a second time to find a quarter (1/4) peak location. Since, as discussed above, the typical

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histogram distribution closely resembles a normal Gaussian distribution, the determination of the quarter (1/4) peak value represents a reasonable estimate of two sigma points from the mean (background peak) in the histogram. In other words, the grey level having a frequency less than or equal to 1/4 the peak frequency represents a point that is two (2) standard deviations away from the mean or background peak point in the histogram distribution. To find the 1/4 peak value, the histogram address is reset to 255 and when the previously found white peak location is reached, subsequent histogram bin values are compared with this maximum peak value (peak frequency value) until a grey level is found which has a frequency value less than or equal to 1/4 of the frequency value associated with the white peak location.

Detailed Description Text (15):

If the quarter (1/4) peak frequency location cannot be determined because the background peak in the histogram is not dominant or there is another dominant mode in the histogram adjacent to the background mode, the background determiner 20 tries to find the grey level value which is one standard deviation away from the mean or peak value of the histogram. To find this grey level or peak location, the background determiner 20 also scans the histogram data to find the closest grey level which has a peak frequency equal to 5/8 of the peak frequency of the white peak.

Current US Original Classification (1):

358/1.9

Current US Cross Reference Classification (1):

358/2.99

Current US Cross Reference Classification (2):

358/463

Current US Cross Reference Classification (3):

358/465

Current US Cross Reference Classification (4):

382/169

Current US Cross Reference Classification (5):

382/172

Current US Cross Reference Classification (6):

382/275

CLAIMS:

6. The system as set forth in claim 1 wherein the thresholding circuit determines the background threshold value based on an equation: background threshold value=background peak value-scaling factor*(2 sigma) where the 2 sigma is a value about 2 standard deviations from the background peak value based on the histogram.

12. The image processing system as set forth in claim 9 wherein the thresholding circuit determines the background threshold value based on an equation: background threshold value=peak grey value-scaling factor*(2 sigma) where the scaling factor is selectable by a user and 2 sigma is about 2 standard deviations from the peak grey value based on the histogram data.

21. An image processing system for reproducing an image formed of a plurality of pixels each represented by an image grey value and for suppressing background grey values of the image, the system comprising:

a histogram generator for generating histogram data representing frequencies of the image grey values;

a background determiner for determining a peak grey value from the histogram data, the peak grey value being set as a background threshold value defining the background grey

values to be suppressed; and

a thresholding circuit for dynamically adjusting the background threshold value to increase a number of the background grey values to be suppressed, the thresholding circuit adjusting the background threshold value based on an equation: background threshold value=peak grey value-scaling factor*(2 sigma), where the scaling factor is selectable by a user, between 0 and 27/8 in 1/8 increments, and 2 sigma is about 2 standard deviations from the peak grey value based on the histogram data.

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 3. Document ID: US 6198845 B1

L6: Entry 3 of 13

File: USPT

Mar 6, 2001

DOCUMENT-IDENTIFIER: US 6198845 B1

TITLE: Method for determining document background for adjusting the dynamic range of an image of the document

Application Filing Date (1):
19970701

Brief Summary Text (7):

Automatic background suppression senses the background and automatically suppresses the background before final printing. Conventional automatic background suppression systems generate a histogram of the document using standard methods and then calculate the mean and standard deviation. This often involves significant amounts of calculation to determine the gain needed to eliminate the background noise.

Current US Original Classification (1):
382/169

Current US Cross Reference Classification (2):
358/3.01

Current US Cross Reference Classification (3):
358/3.21

Current US Cross Reference Classification (4):
358/3.26

Current US Cross Reference Classification (5):
382/167

Current US Cross Reference Classification (6):
382/260

Current US Cross Reference Classification (7):
382/274

Current US Cross Reference Classification (8):
382/275

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 4. Document ID: US 6141437 A

L6: Entry 4 of 13

File: USPT

Oct 31, 2000

DOCUMENT-IDENTIFIER: US 6141437 A

TITLE: CAD method, computer and storage medium for automated detection of lung nodules in digital chest images

Application Filing Date (1):19951122Brief Summary Text (20):

Step c) preferably further includes determining the contrast, diameter, slope of diameter, degree of circularity, degree of irregularity, slope of circularity, and slope of irregularity of each said island region in the difference image at each % threshold level, eliminating as candidate nodules those candidate nodules determined in the preceding step to have predetermined contrast, diameter, slope of diameter, degree of circularity, degree of irregularity, slope of circularity, and slope of irregularity values, performing a two-dimensional background trend correction in a region of interest of predetermined size centered on the location of each candidate nodule in the original chest image, performing region growing within a portion of the region of interest centered on the location of each candidate nodule in the original chest image at predetermined discrete gray-level increments, quantifying predetermined image features selected from the group consisting of contrast, effective diameter, degree of circularity, degree of irregularity, net contrast, slope of diameter, slope of circularity, slope of irregularity, average gradient, standard deviation of edge gradient orientation histogram at each said gray-level increment for each grown region, determining a transition point at which the effective diameter abruptly increases, eliminating as candidate nodules those candidate nodules exhibiting a predetermined contrast, effective diameter, degree of circularity, degree of irregularity, net contrast at the transition point, and eliminating as candidate nodules those candidate nodules having a slope of diameter, slope of circularity, slope of irregularity, average gradient, and standard deviation of edge gradient histogram below a predetermined lower limit or above a predetermined upper limit.

Current US Original Classification (1):382/130Current US Cross Reference Classification (3):382/132Current US Cross Reference Classification (4):382/172Current US Cross Reference Classification (5):382/203

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. Desc | Ima |
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☐ 5. Document ID: US 6064762 A

L6: Entry 5 of 13

File: USPT

May 16, 2000

DOCUMENT-IDENTIFIER: US 6064762 A

TITLE: System and method for separating foreground information from background information on a document

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Application Filing Date (1):
19960819

Brief Summary Text (14):

The methods mentioned by Sahoo et al. for improving the histograms by means of edge operators cannot be used for highly structured backgrounds since the method does not differentiate between the edges of the background and those of the entry. The standard deviation of adjacent grey values is even less suitable for changing the histogram, since here too not only the entry but more particularly the background leads to an increased value of the standard deviation.

Current US Original Classification (1):
382/171

Current US Cross Reference Classification (1):
382/172

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 6. Document ID: US 6043900 A

L6: Entry 6 of 13

File: USPT

Mar 28, 2000

DOCUMENT-IDENTIFIER: US 6043900 A

TITLE: Method and system for automatically detecting a background type of a scanned document utilizing a leadege histogram thereof

Application Filing Date (1):
19980331

Detailed Description Text (57):

If the quarter (1/4) peak frequency location cannot be determined because the background peak in the histogram is not dominant or there is another dominant mode in the histogram adjacent to the background mode, the present invention tries to find the grey level value which is one standard deviation away from the mean or peak value of the histogram. To find this grey level or peak location, the present invention also scans the histogram data to find the closest grey level which has a peak frequency equal to 5/8 of the peak frequency of the white peak.

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (1):
382/169

Current US Cross Reference Classification (2):
382/274

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 7. Document ID: US 5881166 A

L6: Entry 7 of 13

File: USPT

Mar 9, 1999

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DOCUMENT-IDENTIFIER: US 5881166 A

TITLE: Method and system for generating a histogram of a scanned image

Application Filing Date (1):19961121Detailed Description Text (41):

If the quarter (1/4) peak frequency location cannot be determined because the background peak in the histogram is not dominant or there is another dominant mode in the histogram adjacent to the background mode, the present invention tries to find the grey level value which is one standard deviation away from the mean or peak value of the histogram. To find this grey level or peak location, the present invention also scans the histogram data to find the closest grey level which has a peak frequency equal to 5/8 of the peak frequency of the white peak.

Current US Original Classification (1):382/168Current US Cross Reference Classification (1):382/172

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 8. Document ID: US 5848183 A

L6: Entry 8 of 13

File: USPT

Dec 8, 1998

DOCUMENT-IDENTIFIER: US 5848183 A

TITLE: System and method for generating and utilizing histogram data from a scanned image

Application Filing Date (1):19961121Detailed Description Text (41):

If the quarter (1/4) peak frequency location cannot be determined because the background peak in the histogram is not dominant or there is another dominant mode in the histogram adjacent to the background mode, the present invention tries to find the grey level value which is one standard deviation away from the mean or peak value of the histogram. To find this grey level or peak location, the present invention also scans the histogram data to find the closest grey level which has a peak frequency equal to 5/8 of the peak frequency of the white peak.

Current US Original Classification (1):382/172Current US Cross Reference Classification (1):382/168

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 9. Document ID: US 5835628 A

L6: Entry 9 of 13

File: USPT

Nov 10, 1998

h e b b g e e f e ef b e

DOCUMENT-IDENTIFIER: US 5835628 A

TITLE: Method and system for generating histograms from a scanned image

Application Filing Date (1):19961121Detailed Description Text (41):

If the quarter (1/4) peak frequency location cannot be determined because the background peak in the histogram is not dominant or there is another dominant mode in the histogram adjacent to the background mode, the present invention tries to find the grey level value which is one standard deviation away from the mean or peak value of the histogram. To find this grey level or peak location, the present invention also scans the histogram data to find the closest grey level which has a peak frequency equal to 5/8 of the peak frequency of the white peak.

Current US Original Classification (1):382/168Current US Cross Reference Classification (1):382/172

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 10. Document ID: US 5751848 A

L6: Entry 10 of 13

File: USPT

May 12, 1998

DOCUMENT-IDENTIFIER: US 5751848 A

TITLE: System and method for generating and utilizing histogram data from a scanned image

Application Filing Date (1):19961121Detailed Description Text (41):

If the quarter (1/4) peak frequency location cannot be determined because the background peak in the histogram is not dominant or there is another dominant mode in the histogram adjacent to the background mode, the present invention tries to find the grey level value which is one standard deviation away from the mean or peak value of the histogram. To find this grey level or peak location, the present invention also scans the histogram data to find the closest grey level which has a peak frequency equal to 5/8 of the peak frequency of the white peak.

Current US Original Classification (1):382/172Current US Cross Reference Classification (1):382/168

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Ima |
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☐ 11. Document ID: US 5289374 A

L6: Entry 11 of 13

File: USPT

Feb 22, 1994

h e b b g e e e f e ef b e

DOCUMENT-IDENTIFIER: US 5289374 A

TITLE: Method and system for analysis of false positives produced by an automated scheme for the detection of lung nodules in digital chest radiographs

Application Filing Date (1):

19920228

Brief Summary Text (13):

These and other objects are accomplished by using a new, automated method and system for eliminating a number of false-positive nodule candidates using a region growing technique on identified candidates and then performing feature extraction techniques on the grown regions in order to determine information about the nodule candidates. This information includes such parameters as (1) the effective diameter of the grown regions, (2) the degree of circularity and (3) the degree of irregularity. Additional parameters such as the nodule candidate contrast, background contrast, edge gradient orientation and standard deviation of the gradient-orientation histogram are also determined to provide additional computer generated data information about the nodule candidates.

Current US Cross Reference Classification (2):

382/132

Current US Cross Reference Classification (3):

382/256

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KMC | Draw Desc | Images |
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☒ 12. Document ID: US 5140416 A

L6: Entry 12 of 13

File: USPT

Aug 18, 1992

DOCUMENT-IDENTIFIER: US 5140416 A

TITLE: System and method for fusing video imagery from multiple sources in real time

Application Filing Date (1):

19900918

Detailed Description Text (3):

The system accepts digitized pixel aligned data from each sensor at the feature/background separation circuit which separates the video signals from input into features and backgrounds. The background is selected or generated on a global basis. The feature/background separation circuit generates the features from each of the first and second inputs on separate lines to a local area feature selection circuit and also generates the background from each of the first and second digital video inputs on separate lines to a global background selection circuit. The feature selection circuit selects the appropriate, principal or best feature at each pixel, on a pixel by pixel basis, such as the feature with the greatest magnitude, and sends a single composite feature video stream signal indicative thereof to the feature/background merge circuit. The background selection circuit selects the background on a global basis rather than on a pixel by pixel basis. The selected background may be either of the first video background or the second video background or an average of the two. Under most circumstances, the average background is selected. In certain applications where one of the background signals contains little useful information, the other background signal may be selected. The selection process can be automated by using the background statistics as criteria for selecting the desired output. The statistics utilized would be the standard deviation of the grey level histogram or the peak-to-peak values of the background signals. Both the peak-to-peak statistic and the standard deviation of the

grey level histogram are indicative of the variations seen in the background. The background selection circuitry sends a single composite video signal indicative thereof to the feature background merge circuit. These composite feature video stream signals and composite background video stream signals are the merged into a final composite fused video output by the feature/background merge circuit.

Detailed Description Text (18):

Similarly, if the grey level histogram is used in addition to or in place of the peak-to-peak statistic, then the standard deviation of this histogram distribution, being indicative of the information content in the background signals, is utilized as the selection criterion. Again, the selection process is governed by the following:

Detailed Description Text (19):

1. If background histogram standard deviation statistics from both of the background signals exceed user defined criteria, being indicative of adequate information content in both background signals, then an average of the video 1 and video 2 background signals is selected to be output as the composite background in the next video frame.

Current US Cross Reference Classification (3):

382/173

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Abstract | Machine Is | Claims | KWIC | Draw Desc | Ima |
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☐ 13. Document ID: JP 61123986 A

L6: Entry 13 of 13

File: JPAB

Jun 11, 1986

DOCUMENT-IDENTIFIER: JP 61123986 A

TITLE: RECOGNIZING DEVICE

Abstract Text (1):

PURPOSE: To decide a recognized result with a high reliability by collating the digital video signal of a pattern to be recognized with a previously produced dictionary pattern, producing histograms of background and character parts and obtaining their means and standard deviations.

Abstract Text (2):

CONSTITUTION: A histogram producing circuit 61 produces two histograms from recognition subject patterns transmitted from a dictionary memory 5 and a frame memory 4. Where means and standard deviations of histograms of the background and character parts are $-a$, $-b$, σ_a and σ_b , respectively, a coincident signal is transmitted to a recognized result deciding circuit 63d if $\sigma_a \leq S_a$ and $\sigma_b \leq S_b$ (S_a and S_b : slice level) in a standard deviation deciding circuit 63c, and $|\bar{-a} - \bar{-b}| > \Delta$ (prescribed value) in a mean deciding circuit 63b can be established. Only when the coincident signals are transmitted from both the circuit 63b and the circuit 63c, the circuit 63d outputs a signal for showing the coincidence of the subject pattern with the dictionary pattern: otherwise, the circuit 63d outputs a dissident signal. Thus the recognizing device with a high reliability can be obtained.

Application Date (1):

19841120

Current US Cross Reference Classification (1):

382/170

Current US Cross Reference Classification (2):

382/218

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequence | File Name | Claims | K/MC | Draw Desc | Ima |
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| STANDARDS | 198619 |
| BACKGROUND\$3 | 0 |
| BACKGROUND | 3115915 |
| BACKGROUNDDA | 1 |
| BACKGROUNDAND | 1 |
| BACKGROUNDART | 3 |
| BACKGROUNDCLR | 1 |
| BACKGROUNDDD | 15 |
| BACKGROUNDED | 23 |
| BACKGROUNDER | 221 |
| (L5 AND BACKGROUND\$3 WITH HISTOGRAM\$3 WITH (STANDARD ADJ1 DEVIATION\$3)).PGPB,USPT,EPAB,JPAB,DWPI,TDBD. | 13 |

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